List of Appendices

Maine Volunteer River Monitoring Program

Appendix 1

Basic QA/QC Concepts

A chapter on data quality objective criteria such as precision, accuracy, representativeness, and other important criteria

Chapter 3 of:
U. S. Environmental Protection Agency (USEPA), 1996. The Volunteer Monitor's Guide to Quality Assurance Project Plans. Office of Wetlands, Oceans and Watersheds; USEPA document # 841-B-96-003; Washington, D.C., 59 pp.
< https://www.epa.gov/sites/production/files/2015-06/documents/vol_qapp.pdf> (as of 11/21/2019)

United States
Environmental Protection
Agency

Office of Wetlands,
Oceans and Watersheds
4503F

EPA 841-B-96-003
September 1996

The Volunteer Monitor's Guide To

Quality Assurance Project Plans

Chapter 3: SOME BASIC QA /QC CONCEPTS

As coordinator of a volunteer monitoring program, you are probably involved in many aspects of project planning, sample collection, laboratory analysis, data review, and data assessment. You should be considering quality assurance and quality control activities in every one of these steps.

Quality assurance (QA) refers to the overall *management system* which includes the organization, planning, data collection, quality control, documentation, evaluation, and reporting activities of your group. QA provides the information you need to ascertain the quality of your data and whether it meets the requirements of your project. QA ensures that your data will meet defined standards of quality with a stated level of confidence.

QA ensures that your data will meet defined standards of quality with a stated level of confidence.

Quality control (QC) refers to the routine *technical activities* whose purpose is, essentially, error control. Since errors can occur in either the field, the laboratory or in the office, QC must be part of each of these functions. QC should include both internal and external measures (see side box).

Together, QA and QC help you produce data of known quality, enhance the credibility of your group in reporting monitoring results, and ultimately save time and money. However, a good QA/QC program is only successful if everyone consents to follow it and if all project components are available in writing. The Quality Assurance Project Plan (QAPP) is the written record of your QA/QC program.

This chapter is designed to introduce you to the terminology of quality assurance/quality control. The key terms we will be addressing are: precision, accuracy (sometimes referred to as bias), representativeness, completeness, comparability, and sensitivity. You will

QC Measures

Internal Quality Control is a set of measures that the project undertakes *among its own samplers and within its own lab* to identify and correct analytical errors. Examples include lab analyst training and certification, proper equipment calibration and documentation, laboratory analysis of samples with known concentrations or repeated analysis of the same sample, and collection and analysis of multiple samples from the field.

External Quality Control is a set of measures that involves *laboratories and people outside of the program*. These measures include performance audits by outside personnel, collection of samples by people outside of the program from a few of the same sites at the same time as the volunteers, and splitting some of the samples for analysis at another lab.

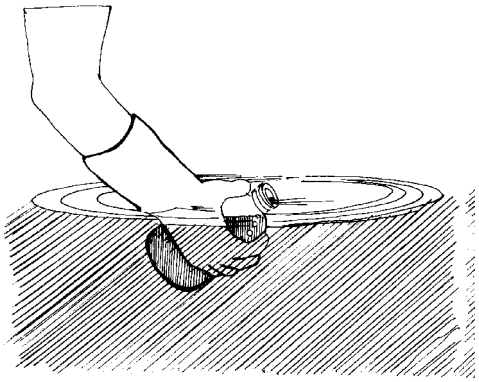
External and internal QC measures are described in more detail in the "QC Samples" box at the end of this chapter.

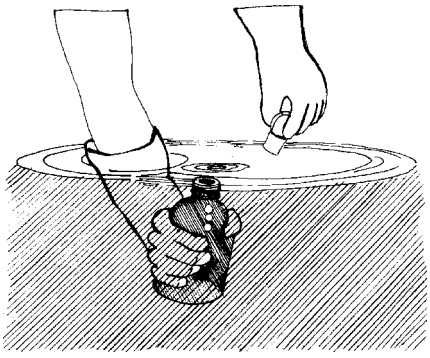
Measures of precision, accuracy, representativeness, completeness, comparability, and sensitivity help us evaluate sources of variability and error and thereby increase confidence in our data.

be seeing these terms again, so you may want to spend some time getting to know them.

In natural systems, such as streams, lakes, estuaries, and wetlands, variability is a factor of life. Changes in temperature, flow, sunlight, and many other factors affect these systems and the animals that inhabit them. Variability also occurs when we attempt to monitor such systems. Each of us reads, measures, and interprets differently; we may also apply different levels of effort in how we monitor. The equipment we use may be contaminated, broken or incorrectly calibrated. These and many other differences can lead to variability in monitoring results. Measures of precision, accuracy, representativeness, completeness, comparability, and sensitivity help us evaluate sources of variability and error and thereby increase confidence in our data.

Because all projects have different goals, data users and uses, capabilities, and methods, this document cannot tell you what levels of precision, accuracy, representativeness, completeness, comparability, and sensitivity are acceptable for your individual project. You will need to consult your advisory panel (in particular, your data users), the laboratory you deal with, and peer reviewers to determine acceptance criteria for your monitoring project.





Precision

Precision is the degree of agreement among repeated measurements of the same characteristic on the same sample or on separate samples collected as close as possible in time and place. It tells you how consistent and reproducible your field or laboratory methods are by showing you how close your measurements are to each other. It does not mean that the sample results actually reflect the "true" value, but rather that your sampling and analysis are giving consistent results under similar conditions.

Typically, precision is monitored through the use of replicate samples or

measurements. Replicate samples are two or more samples taken from the same place at the same time.

When you have many replicate samples, determine precision by calculating the **standard deviation(s)** of the samples. The standard deviation indicates the range of variation in the measurements you've taken. Many of today's calculators perform the standard deviation calculation.

The **relative standard deviation (RSD)**, or coefficient of variation, expresses the standard deviation as a percentage. This is generally easier for others to understand. The smaller the relative standard deviation (or standard deviation), the more precise your measurements.

When you have only two replicate samples, determine precision by calculating the **relative percent difference (RPD)** of the two samples. Again, the smaller the relative percent difference, the more precise your measurements.

STANDARD DEVIATION

The Volunteer Creek Monitoring Project wants to determine the precision of its temperature assessment procedure. They have taken 4 replicate samples:

Replicate 1 (X_1) = 21.1^0 C
Replicate 2 (X_2) = 21.1^0 C
Replicate 3 (X_3) = 20.5^0 C
Replicate 4 (X_4) = 20.0^0 C

To determine the **Standard Deviation (s)**, use the following formula:

$$s = \sqrt{\sum_{i=1}^{n} \frac{(X_1 - \overline{X})^2}{n-1}}$$

where x_i = measured value of the replicate, $\bar{x}$ = mean of replicate measurements, n = number of replicates, $\sum$ = the sum of the calculations for each measurement value--in this case, X_1 through X_4

First, figure out the mean, or average of the sample measurements. Mean = $(X_1 + X_2 + X_3 + X_4) \div 4$. In this example, the mean is equal to 20.68^0 C.

Then, for each sample measurement (X_1 through X_4), calculate the next part of the formula. For X_1 and X_2, the calculation would look like this:

$$\frac{(21.1 - 20.68)^2}{4-1} = \frac{(-0.42)^2}{3} = \frac{0.1764}{3} = 0.0588$$

For X_3 the calculation would be 0.0108; and for X_4 it would be 0.1541

Finally, add together the calculations for each measurement and find the square root of the sum: 0.0588 + 0.0588 + 0.0108 + 0.1541 = 0.2825. The square root of 0.2825 is 0.5315.

So, the standard deviation for temperature is 0.532 (rounded off).

RELATIVE STANDARD DEVIATION

If we use the same replicate measurements as above in the standard deviation example, we can determine the **Relative Standard Deviation (RSD)**, or coefficient of variation, using the following formula:

$$RSD = \frac{s}{\overline{X}} \times 100$$

where s = standard deviation and $\bar{x}$ = mean of replicate samples.

We know s = 0.5315 and that $\bar{x}$ = 20.68. So, the RSD = 2.57. This means that our measurements deviate by about 2.57%.

RELATIVE PERCENT DIFFERENCE

If the Volunteer Creek project had only two replicates (21.1^0 C and 20.5^0 C) they would use **Relative Percent Difference (RPD)** to determine precision.

$$RPD = \frac{(X_1 - X_2) \times 100}{(X_1 + X_2) \div 2}$$

where X_1 = the larger of the two values and X_2 = the smaller of the two values. In this example, $X_1 = 21.1^0$ and $X_2 = 20.5^0$.

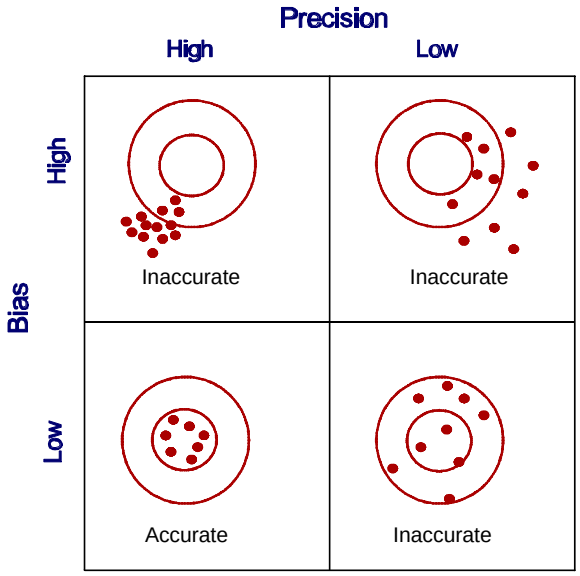
$$RPD = \frac{(21.1-20.5) \times 100}{(21.1+20.5) \div 2} = \frac{60.00}{20.8} = 2.88$$

So, in this example, the RPD between our sample measurements is 2.88%.

Accuracy

Accuracy is a measure of confidence in a measurement. The smaller the difference between the measurement of a parameter and its "true" or expected value, the more accurate the measurement. The more precise or reproducible the result, the more reliable or accurate the result.

PRECISION, BIAS, AND ACCURACY



Measurement accuracy can be determined by comparing a sample that has a known value, such as a standard reference material or a performance evaluation sample, to a volunteer's measurement of that sample (see note below). Increasingly, however, some scientists, especially those involved with statistical analysis of measurement data, have begun to use the term "bias" to reflect this error in the measurement system and to use "accuracy" as indicating both the degree of precision and bias (see "bullseye" figure at left). For the purpose of this document, the term "accuracy" will be used.

If you are concerned that other components of a sample matrix (e.g., soil or sludge) may be interfering with analysis of a parameter, one way to measure accuracy is to add a known concentration of the parameter to a portion of the sample. This is called a spiked sample. The difference between the original measurement of the parameter in the sample and the measurement of the spiked sample should equal (or be close to) the added amount. The difference indicates your ability to obtain an accurate measurement.

ACCURACY

Attendance at QC training sessions is required for Volunteer Creek monitors. In the field, monitors use a Jones Wide-Range pH Kit, which covers a full range of expected pH values. During a recent training session, the monitors recorded the following results when testing a pH standard buffer solution of 7.0 units.

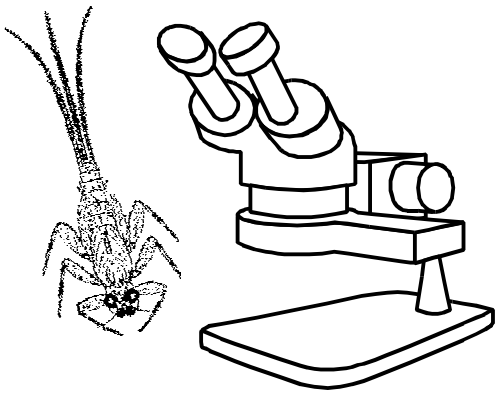
7.5	7.2	6.5	7.0
7.4	6.8	7.2	7.4
6.7	7.3	6.8	7.2

Accuracy = average value - true value

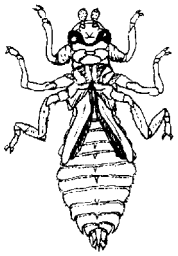
The average of these measurements is equal to 7.08 units. Since we know that the reference or "true" value is 7.0 units, the difference between the average pH value is off or biased by + 0.08 units. This level of accuracy is satisfactory for the data quality objectives of the project.

For many parameters such as secchi depth and macroinvertebrate abundance, no standard reference or performance evaluation samples exist. In these cases, the trainer's results may be considered the reference value to

which the volunteer's results are compared. This process will help evaluate if the volunteer measurements are biased as compared to the trainer's.



If you are monitoring biological conditions by collecting and identifying specimens, maintaining a voucher collection is a good way to determine if your identification procedures are accurate. The voucher collection is a preserved archive of the organisms your volunteers have collected and identified. An expert taxonomist can then provide a "true" value by checking the identification in the voucher collection.



It is important to note that the relationship between a voucher collection and accurate identification cannot be expressed numerically in your QAPP. Rather, the QAPP document should indicate that you have a voucher collection and describe how it is used to evaluate consistent accurate identification in your program.

Note: Standard reference material (in the form of solids or solutions with a certified known concentration of pollutant) can be obtained from a variety of companies, including the National Institute of Standard and Technologies, that sell quality control, proficiency, or scientific reference materials.

Representativeness

Representativeness is the extent to which measurements actually depict the true environmental condition or population you are evaluating. A number of factors may affect the representativeness of your data. For instance, are your sampling locations indicative of the waterbody? Data collected just below a pipe outfall is not representative of an entire stream. Minimizing the effects of variation is critical in the development of your sampling design.

Completeness

Completeness is a measure of the number of samples you must take to be able to use the information, as compared to the number of samples you originally planned to take. Since there are many reasons why your volunteers may not collect as many samples as planned, as a general rule you should try to take more samples than you determine you actually need. This issue should be discussed within your QAPP team and by peer reviewers before field activities begin.

COMPLETENESS

The Volunteer Creek Monitoring project planned to collect 20 samples, but because of volunteer illness and a severe storm, only 17 samples were actually collected. Furthermore, of these, two samples were judged invalid because too much time elapsed between sample collection and lab analysis. Thus, of the 20 samples planned, only 15 were judged valid.

The following formula is used to determine **Percent Completeness (%C).**

$$\%C = \frac{v}{T} x 100$$

where v = the number of planned measurements judged valid and T = the total number of measurements.

In this example, v = 15 and T = 20. In this case, percent completeness would be 75 percent. Is this enough information to be useful?

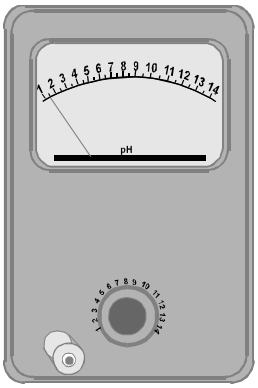
To calculate percent completeness, divide the number of measurements that have been judged valid by the total number of measurements you originally planned to take and then multiply by 100.

Remember, completeness requirements can be lowered if extra samples are factored into the project. The extra samples in turn, increase the likelihood of more representative data.

Comparability

Comparability is the extent to which data from one study can be compared directly to either past data from the current project or data from another study. For example, you may wish to compare two seasons of summer data from your project or compare your summer data set to one collected 10 years ago by state biologists.

Using standardized sampling and analytical methods, units of reporting, and site selection procedures helps ensure comparability. However, it is important to keep in mind that some types of monitoring rely heavily on best professional judgement and that standard methods may not always exist.



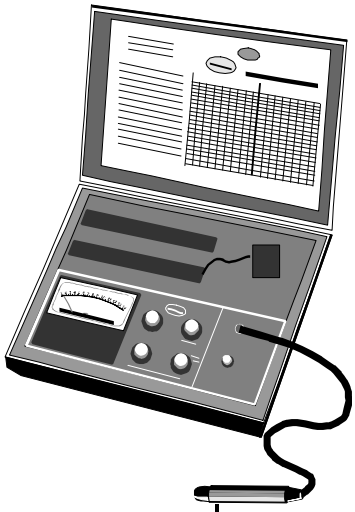
Detection Limit

The term *detection limit* can apply to monitoring and analytical instruments as well as to methods. In general, detection limit is defined as the lowest concentration of a given pollutant your methods or equipment can detect and report as greater than zero. Readings that fall below the detection limit are too unreliable to use in your data set. Furthermore, as readings approach the detection limit (that is, as they go from higher, easier-to-detect concentrations to lower, harder-to-detect concentrations) they become less and less reliable. Manufacturers generally provide detection limit information with high-grade monitoring equipment such as meters.

Measurement Range

The *measurement range* is the range of reliable measurements of an instrument or measuring device. Preassembled kits usually come with information indicating

the measurement range that applies. For example, you might purchase a kit that is capable of detecting pH falling between 6.1 and 8.1. However, pH can theoretically range from 0.0 to 14.00. If acidic conditions (below 6) are a problem in the waters you are monitoring, you will need to use a kit or meter that is sensitive to the lower pH ranges.



Quality Control (QC) Samples

Contamination is a common source of error in both sampling and analytical procedures. QC samples help you identify when and how contamination might occur. For most projects, there is no set number of field or laboratory QC samples which must be taken. The general rule is that 10% of samples should be QC samples. This means that if 20 samples are collected, at least one additional sample must be added as a QC sample. The laboratory must also run its own QC samples. For a new monitoring project or for a new analytical procedure, it is a good idea to increase the number of QC samples (up to 20%) until you have full confidence in the procedures you are using.

The general rule is that 10% of samples should be quality control (QC) samples.

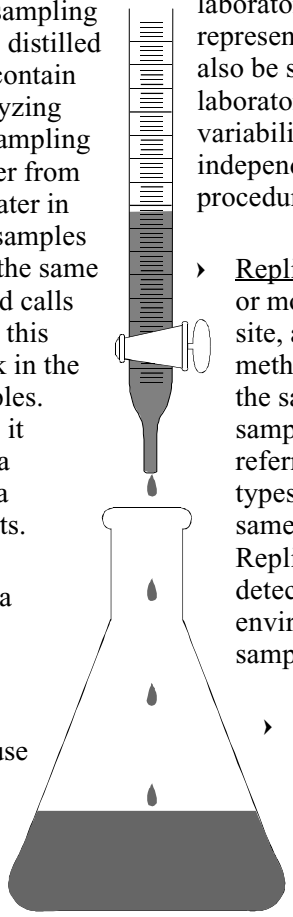
When the project is over, determine data quality by evaluating the results of all the QC samples and determining precision and accuracy. For QC samples that are not blind to the lab, require the lab to calculate and report precision and accuracy results. Lab reported precision and accuracy results can then be checked during data validation.

The decision to accept data, reject it, or accept only a portion of it is should be made after analysis of all QC data. Various types of QC samples are described in the box on the next page.

QC SAMPLES

- A field blank is a "clean" sample, produced in the field, used to detect analytical problems during the whole process (sampling, transport, and lab analysis). To create a field blank, take a clean sampling container with "clean" water (i.e., distilled or deionized water that does not contain any of the substance you are analyzing for) to the sampling site. Other sampling containers will be filled with water from the site. Except for the type of water in them, the field blank and all site samples should be handled and treated in the same way. For example, if your method calls for the addition of a preservative, this should be added to the field blank in the same manner as in the other samples. When the field blank is analyzed, it should read as analyte-free or, at a minimum, the reading should be a factor of 5 below all sample results.

- An equipment or rinsate blank is a "clean" sample used to check the cleanliness of sample collection equipment. This type of blank is used to evaluate if there is carryover contamination from reuse of the same sampling equipment. A sample of distilled water is collected in a sample container using regular collection equipment and analyzed as a sample.



- A split sample is one sample that is divided equally into two or more sample containers and then analyzed by different analysts or labs. Split samples are used to measure precision. Samples should be thoroughly mixed before they are divided. Large errors can occur if the analyte is not equally distributed into the two containers. A sample can be split in the field, called a field split, or in the laboratory, a lab split. The lab split measures analytical precision while the field split measures both analytical and field sampling precision. In addition, a sample split in the field and submitted to the laboratory without informing the laboratory represents a blind sample. Split samples can also be submitted to two different laboratories for analysis to measure the variability in results between laboratories independently using the same analytical procedures.

- Replicate samples are obtained when two or more samples are taken from the same site, at the same time, using the same method, and independently analyzed in the same manner. When only two samples are taken, they are sometimes referred to as duplicate samples. These types of samples are representative of the same environmental condition. Replicates (or duplicates) can be used to detect both the natural variability in the environment and that caused by field sampling methods.

- Spiked samples are samples to which a known concentration of the analyte of interest has been added. Spiked samples are used to measure accuracy. If this is done in the field, the results reflect the effects of preservation, shipping, laboratory preparation, and analysis. If done in the laboratory, they reflect the effects of the analysis from the point when the compound is added, e.g. just prior to the measurement step. Percent recovery of the spike material is used to calculate analytical accuracy.

Maine Volunteer River Monitoring Program

Appendix 2

Standard Operating Procedures Catalog ("SOP Cookbook")

Note: Appendix 2 “Standard Operating Procedures Catalog/SOP Cookbook” is saved as individual documents due to the large number of files and to allow for ease of access by volunteer groups to SOPs applicable to them.

Maine Volunteer River Monitoring Program

Appendix 3

Sampling and Analysis Plan Template

1.0 Title and Approval Page

Maine Volunteer River Monitoring Program (VRMP)
Quality Assurance Program Plan

SAMPLING and ANALYSIS PLAN (SAP)

Maine Department of Environmental Protection
Bureau of Water Quality
Division of Environmental Assessment

Title of SAP:

Volunteer Group Name:

Date of Latest Modification to SAP:

Date of VRMP QAPP Being Referenced in this SAP:

<u>Review & Approval Signatures</u>:

Volunteer Group's Project Coordinator: _____
Date

Volunteer Group's Data Manager: _____
Date

Maine DEP-VRMP Coordinator: _____
Date

Maine DEP-DEA Division Director (or designee): _____
Date

1.1 Table of Contents

1.2 List of Tables, Figures, and Appendices

List of Tables

List of Figures

List of Appendices

Acronyms Commonly Used in This Document

DEP	Department of Environmental Protection (also MDEP)
EGAD	Environmental and Geographic Analysis Database
Pre-EDD	Pre-Electronic Data Deliverable
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
VRMP	Volunteer River Monitoring Program

I. PROJECT MANAGEMENT (cont'd)

1.3 SAP Distribution List

Names & contact information for Maine DEP recipients: *(include name, title, phone number, and email address)*

1)

2)

3)

4)

Names & contact information for volunteer group representatives: *(include name, title, organization, phone number, and email address) Co-coordinators (if applicable) and Data Managers*

1)

2)

3)

4)

Names and contact information of external technical reviewer(s), if any: *(include name, title, organization, phone number, and email address)*

1)

2)

1.4 Project / Task Organization.

- Identify the individuals and organizations participating in your project and outline their specific roles and responsibilities (Table 1) other than those already included in the Maine DEP's Volunteer River Monitoring Program (VRMP) QAPP.
- Include group's coordinator(s), decision-makers, project data manager, principal data users, laboratories and any other persons critical to the implementation of the SAP.
- Each entry should include the following: name, title, organization, and a brief description of that person's or organization's responsibilities related to this specific project.
- Use or include an organizational chart (Figure 1) or table that identifies reporting relationships between and within organizations and between personnel participating in the project.

Figure 1. Organizational Flow Chart

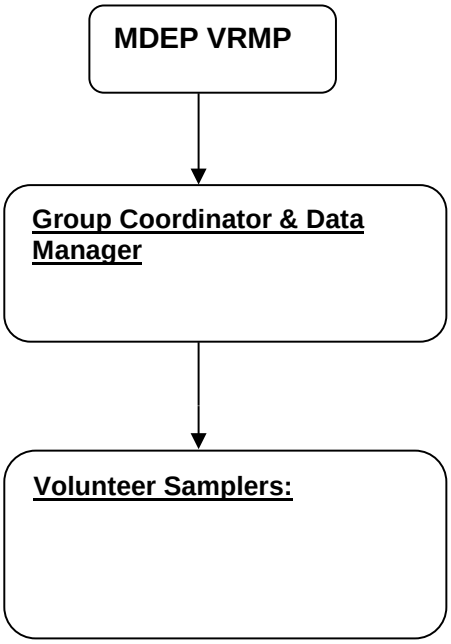


Table 1: Position and Responsibilities of Group's Volunteer Monitors

POSITION	RESPONSIBILITIES
Volunteer Group Coordinator:	• Oversees organization of group's Volunteer monitoring program • Assists MDEP VRMP staff with sampling site location determinations and any changes to sites • Develops and updates Sampling & Analysis Plan (SAP) • Assists with volunteer training sessions • Recruits and manages volunteers • Ensures volunteers receive most up-to-date copy of the SAP, and that it is signed by the volunteers • Acts as primary contact with recruited volunteers • Coordinates with lab that provides analyses
Data Manager:	• Collects and reviews volunteer data sheets for quality assurance • Inputs data into Pre-EDD spreadsheet (for MDEP database) • Looks at suspect data and contacts VRMP program with questions • Sends completed field forms to VRMP
Volunteer Samplers:	• Attends annual training session • Collects water quality data and records observations

1.5 Problem Definition / Project Background.

- Provide sufficient background information to provide a historical, scientific, and regulatory perspective for the project.

- Describe any known water quality impact issues, studies, local ordinances, or watershed management plans which form the basis for the project. Information on Maine's water classification, assessment reports, and water quality data is available on Maine DEP's Rivers and Streams website: < http://www.maine.gov/dep/water/rivers-streams/index.html >.

1.6 Project / Task Description.

- Provide an overview of the project.

- Describe your group's expected goals for participating in the VRMP (e.g. baseline data, determine health of watershed, potential for re-classification). In addition to expected goals state the specific problem to be solved, decision to be made, or outcome to be achieved. In other words, describe the reason the monitoring is being done.

- This section must give an overall picture of how the project will resolve the problem, goal, or question described in the previous section. Provide a brief summary of the "who, what, where, when, why, and how" aspects of the project. Include a general description of the sampling region (detailed site locations are covered later in this SAP [section 2.0]).

- Summarize work to be performed, products to be produced, and the schedule/timeline.

1. 7 Data Quality Objectives and Criteria.

- Discuss your targeted data quality objectives and measurement performance criteria for all parameters that include the following. Refer to Table 3a and Table 3c of the VRMP QAPP and list any deviations or additions.
    - *Precision*: in most cases, using the relative percent difference or "RPD" method
    - *Accuracy*: shows how close a sample result is to the actual value
    - *Measurement range*: the range of reliable measurements of an instrument or measuring device
    - *Quality control samples*: in most cases, 10% of samples should be quality control samples

- Discuss the representativeness of sampling design and monitoring schedule: collecting samples that represent actual stream conditions (example considerations: season, time of day, frequency of sampling).

- Discuss the completeness required (completeness is the measure of the number of samples you must take to be able to use the information as compared to the number of samples you plan to take).

- Discuss comparability (extend that data can be compared to past data from the project or data from another project).

- (*See Appendix 1 of the VRMP QAPP for more information*). Refer to section 4.4 of the VRMP QAPP for minimum VRMP standards. Insert or append a table summarizing plans, if necessary.

1.8 Training Requirements / Certification.

- Groups participating in the VRMP must be trained or recertified by VRMP/DEP staff on an annual basis.

- Identify and describe any specialized training or certifications needed by personnel in order to successfully complete the project or task.

- Refer to training and certification details included in the Volunteer River Monitoring Program QAPP (see section 4.5) as needed.

- List laboratories that will be part of the study design. Contact the VRMP Coordinator for a list of approved laboratories and the parameters for which they are approved.

1.9 Documentation and Records.

- Describe the process and responsibilities for ensuring the appropriate project personnel have the most current approved version of the QAPP and SAP, including necessary updates.
- Detail the types of data and other records that will be kept in this volunteer group's archives (electronic or hardcopy) as well as how that information will be forwarded to the VRMP. If these details are exactly the same as those described in sections 4.6 and 5.10 of the VRMP QAPP, then a reference to that document is sufficient. If this volunteer group plans any deviations from those protocols, then specify below. (Records can include raw data, data from other sources such as databases or literature, field logs, sample preparation and analysis logs, instrument printouts, model input and output files, reports, and results of calibration and QC checks.)
- Briefly identify any other records and documents applicable to the project that will be produced, such as annual reports and audit reports, if applicable. Specify or reference all applicable requirements for the management of records and documents, including location and length of retention period.

II. DATA GENERATION AND ACQUISITION

2.0 Sampling Process (Experimental) Design.

Describe the experimental data generation or data collection design for the project including the following:

- *Design of the sampling network [Table 3] (i.e. sampling locations)*: Provide a list or table, or map that shows the geographic locations of sample stations (see Figure 2). Be sure to include the geographic coordinates UTM is strongly desired). The VRMP will assist with documenting locations of sampling sites (Appendix 6 {Sampling Site Location Form} of the VRMP contains the necessary form for documenting this information.)
- *Specific water quality, hydrology, habitat and biology parameters to be sampled or monitored [Table 2].*
- *Sampling methods (provide brief summaries here) [Tables 2 and 3].* The details regarding sampling methodologies, protocols and SOPs are saved for Section 2.1.
- *Sampling frequencies [Table 2]* including and sampling season(s) including numbers of samples and monitoring period.
- *Rationale for sampling design* (i.e, addressing the group's goals, representativeness, safety, landowner permission, etc.).
- Insert or append tables, as necessary (see examples below). Refer to sections 5.1 and 5.2 of the VRMP QAPP for guidance.

Table 2: Sampling Parameters, Method and Frequency

Parameter	Method*	Frequency

* Standard Operating Procedures for these methods are in Appendix A

Table 3: Sampling Sites, Group's Site ID#, Coordinates, and Sampling Method

Site Name	Site ID#	Coordinates-UTMs	Freshwater/ Marine	Sampling Method/Location

Figure 2: Map of Sampling Site Locations
Refer to Appendix B for Site Descriptions and Photographs

2.1 Sampling Methods.

- Describe the procedures for collecting samples.
- Identify the sampling methods and equipment, including any implementation requirements, sample preservation requirements, decontamination procedures, and materials needed for projects involving physical sampling.
- Insert or append tables and SOPs as necessary. Refer to sections 4.4, 5.1, and 5.2 of the VRMP QAPP for guidance as needed, as well as Appendix 2 (VRMP Standard Operating Procedures {SOPs} Cookbook).
- Refer to Table 3a of the VRMP QAPP for data quality objectives and Table 3d for typical preservation requirements for various parameters.

2.2 Sample Handling and Custody.

- Describe the requirements for sample handling and custody in the field, laboratory, and transport; taking into account the nature of the samples, storage temperature requirements, the maximum allowable sample holding times before extraction or analysis, and available shipping options and schedules for projects involving physical sampling.
- Refer to the VRMP QAPP as needed (section 5.3 and Appendix 2 and 8). Please note any deviations from these VRMP recommended procedures so that they may be reviewed.
- Indicate which laboratory will be used to analyze your samples, if applicable. (See section 4.5 of the VRMP QAPP for information about laboratories that can be used by volunteer groups wanting to have their data in the VRMP database.)
- Examples of sample labels and chain-of-custody or sample submission forms/logs should be included when they differ from those in the VRMP QAPP (section 5.3, Appendix 10).

2.3 Analytical Methods.

- Identify the analytical methods and equipment required, including sub-sampling or extraction methods, and any specific performance requirements for the method.
- Where appropriate, refer to section 5.4 of the VRMP QAPP and its SOPs (in Appendix 2) or to SOPs from other laboratories.
- Specify the laboratory turnaround time needed, if important to the project schedule. Discuss how problems are addressed in section 3.0 below.

2.4 Quality Control.

- Identify any QC activities needed for each sampling, analysis, or measurement technique that differ from those listed in the VRMP QAPP (sections 4.4 and 5.5) and associated SOPs (Appendix 2). Include if any guidance on when the 10% duplicate should be taken (e.g. on the 10th sample and/or end of field season).
- For any additional QC activities, list the associated method or procedure, and acceptance criteria. Be sure to describe how sample bottles or containers, if used, will be appropriately prepared (rinsed, sterilized, etc.) prior to sampling (or if new containers shall be used), by either a laboratory or the volunteer group.
- Explain arrangements made with the analytical laboratory regarding delivery (i.e. format and timeline) of the results of their internal quality control procedures.

2.5 Instrument / Equipment Testing, Inspection and Maintenance.

- Identify any instrument/equipment testing, inspection and maintenance activities that differ from those listed in the VRMP QAPP (section 5.6) and associated SOPs (Appendix 2). For any different or additional procedures, describe how they will be implemented and documented to assure quality.
- Describe how deficiencies are to be resolved, when re-inspection will be performed, and how the effectiveness of the corrective action shall be determined and documented.
- Describe or reference how periodic preventive and corrective maintenance of measurement or test equipment and their components affecting quality shall be performed to ensure availability and satisfactory performance of the systems (refer to specific equipment manuals if necessary).
- Identify the equipment and/or systems requiring periodic maintenance. When appropriate, assemble such activities into SOP format to be appended to the SAP.

.

2.6 Instrument / Equipment Calibration and Frequency.

- Identify all instruments and other equipment used for data generation/collection activities that must be controlled and, at specified periods, calibrated to maintain performance within specified limits. As stated in the VRMP QAPP (sections 4.4, 4.5, 5.5, and 5.7), instruments will be calibrated and checked against VRMP reference instruments and standards during annual VRMP volunteer certification/ recertification workshops.
- Refer to SOPs for use of each instrument/piece of equipment for specific details about additional calibrations (e.g., most dissolved oxygen meters need to be calibrated each day that they are used).
- For any procedures differing from those found in the VRMP QAPP Appendix 2 (SOPs), describe how each will be implemented and documented to assure quality including: the basis for the calibration, certified equipment and/or standards used for calibration and how records of calibration shall be maintained and be traceable to the instrument.

2.7 Inspection / Acceptance of Supplies and Consumables.

- Describe how and by whom supplies and consumables (standard materials and solutions, sample bottles, reagents, hoses, deionized water, potable water, electronic data storage media, etc.) shall be inspected and accepted for use in the project.
- State the acceptance criteria for such supplies and consumables.
- Refer to the VRMP QAPP (section 5.8), associated SOPs, and equipment manuals as needed.

2.8 Non-direct Measurements.

- Identify any types of data needed for project implementation or decision-making that is obtained from non-measurement sources such as computer databases, programs, literature files or publications, historical information, maps, data from other monitoring groups, or geographic information systems (GIS). Describe the intended use of the data. Define the acceptance criteria for the use of such data in the project, if applicable, and specify any limitations on the use of the data. Refer to the VRMP QAPP (section 5.9) and associated SOPs as needed.
- If collecting weather data refer to websites such as www.weather.com; www.weather.gov; https://www.maine.gov/mema/weather/general-information.

2.9 Data Management.

- Trace the path of the data from their collection/generation to their final use or storage (e.g. the field, the office, the laboratory, town conservation commission, report to watershed council, as well at the VRMP and its EGAD database).
- Describe or reference the standard record-keeping procedures, document control system, and the approach used for data storage and retrieval on electronic media, if different than that detailed in the VRMP QAPP (section 5.10).
- Discuss the control mechanism for detecting and correcting errors and for preventing loss of data during data entry to forms, reports, and databases.
- Provide examples of any forms or checklists to be used.
- Identify and describe all data handling equipment and procedures to process, compile, and analyze the data, including procedures for addressing data generated as part of the project as well as data from other sources, as they apply to your group.
- Describe any data management processes not addressed by the VRMP QAPP (see section 5.10).

III. ASSESSMENT AND OVERSIGHT

3.0 Assessment and Response Actions / Problem Resolution.

- Describe problem assessments and detection procedures specific to the project not addressed by the VRMP QAPP (section 6.1). Assessments can be done on data versus data quality objectives, sampling and analytical methods, data management, audits of test procedures and methods.
- Discuss the information expected from the problem assessments/detections and the success criteria (i.e., goals, performance objectives, acceptance criteria specifications) for each assessment proposed. Include information as to how any problems identified through these assessments will be corrected, who will carry this out and how the effectiveness of the corrective action(s) will be assessed.
- Describe how and to whom the results of each assessment shall be reported. Include details on how the corrective actions will be verified and documented.

3.1 Reports to management.

- Describe reports to VRMP staff specific to the project not addressed by the VRMP QAPP (section 6.2).
- Identify the frequency and distribution of reports issued to inform VRMP staff of project status including periodic data quality assessments and significant quality assurance problems/recommended solutions or corrective actions.
- Identify the individual responsible for such reports, recipients of the reports, and any specific actions recipients are expected to take as a result of the reports.

IV. DATA VALIDATION AND USABILITY

4.0 Data Review, Verification and Validation Requirements.

- State any criteria used to review and validate (accept, reject, or qualify) data, specific to the project not addressed by the VRMP QAPP (section 7.1), especially as they may apply to your group. Table format is preferred.

4.1 Verification and Validation Methods.

- Describe any data verification and validation methods not addressed by the VRMP QAPP (section 7.2), especially as they may apply to your group. These may occur at any step from initial data acquisition through the duration of the project.

- Discuss how issues shall be resolved and the system for resolving such issues. Describe how the results are conveyed to the VRMP and other data users. Provide examples of any forms or checklists to be used. Identify any project-specific calculations required.

4.2 Reconciliation with Data Quality Objectives.

- Describe how it will be determined if the actual data collected meets the data quality objectives described in Section 1.7. If the data does not meet outlined objectives, describe how it will be utilized.

- Describe how reconciliation with data quality objectives will be documented, issues will be resolved, and how limitations on the use of the data will be reported to decision-makers outside of those identified under the VRMP QAPP (section 7.3).

IV. REFERENCES

List any other references as needed.

Maine Department of Environmental Protection. “2016 Integrated Water Quality Monitoring and Assessment Report”. Available at < https://www.maine.gov/dep/water/monitoring/305b/ >.

Maine Volunteer River Monitoring Program / Maine Department Environmental Protection. March 2020. Maine Volunteer River Monitoring Program (VRMP) Quality Assurance Program Plan (QAPP). Updated by Mary Ellen Dennis and Kristin Feindel, Maine Department of Environmental Protection.

U. S. Environmental Protection Agency (USEPA), 1996. The Volunteer Monitor's Guide to Quality Assurance Project Plans. Office of Wetlands, Oceans and Watersheds; USEPA document # 841-B-96-003; Washington, D.C., 59 pp. < https://www.epa.gov/sites/production/files/2015-06/documents/vol_qapp.pdf > (as of 11/21/2019)

Appendices

Attach appendices as needed.

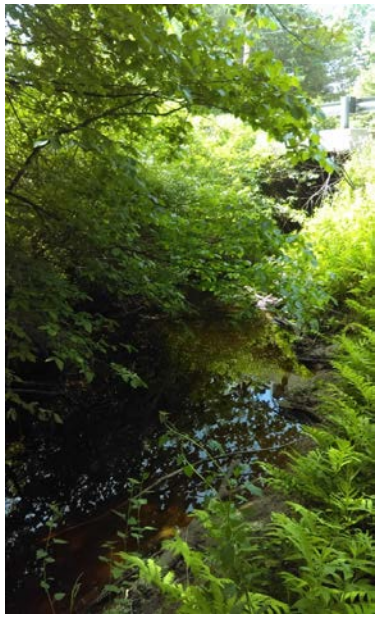
APPENDIX B: 'Stream Name - Group Name' SAMPLING SITE PHOTOS

Site '01'

Site '02'

Site '03'

Site '04'



APPENDIX B: 'Stream Name - Volunteer Group' SAMPLING SITE LOCATION FORM DATA

(Last updated: 'date, by name')

DEP ID#	Station ID	River/Stream Name	Site Name	Town	UTM Northing	UTM Easting	GPS Model	Accuracy (ft.)	Pollution Issues	Riparian Disturb. Y/N	Canopy Cover	Channel Width	Mid-Channel Depth	Primary Bottom Type	Secondary Bottom Type	Dominant Riparian Vegetation	Horizontal Sampling Position	Vertical Sampling Position	Center of Flow?	Sampling Approach	DO Sampling Method	Site Location Description	Date Site Was Initially Documented	Date Site Description Was Updated (if applicable)	Notes
					Must be in NAD83 or WGS84					Y/N	1) 0-25% 2) 25-50% 3) 50-75% 4) 75-100%	(Feet or Meters/Estimated or Measured)		1)Fines 2)Sand 3)Boulder 4)Gravel 5)Cobble 6)Bedrock/Ledge	1)Fines 2)Sand 3)Boulder 4)Gravel 5)Cobble 6)Bedrock/Ledge	1)Wetland 2)Grass 3)Shrub 4)Mixed Succ. 5)Mature Trees 6)Farms	1)Middle 2) Thalweg 3) Outside of Bend, Edge 4) Dock 5) Constricted area 6)Bridge	1) MI-depth 2) Half Arms Length (1 1/2 ft.) 3) Depth profile (1 m. increments)	Y/N	1) Wading 2) Bridge/Culvert 3) Extension Pole 4) Boat 5) Reach	1)Weighted Sampler 2)Direct Probe 3) Kit				

VRMP Group Name: _____ Year: _____

PROJECT OVERSIGHT CERTIFICATION

To be signed by all persons who are responsible for overseeing any and all work, including laboratory analysis, carried out under the terms of this Sampling and Analysis Plan.

"I certify that I have read and understand the requirements of this Sampling and Analysis Plan (SAP), and that I am knowledgeable about the requirements of the Quality Assurance Program/Project Plan (QAPP) to which it refers. I certify that I will fulfill all SAP and QAPP requirements. I will assure that all staff, volunteers, etc., for whom I am responsible are familiar with these requirements and competent to carry out their responsibilities."

Name (print)	Position	Date	Signature

Maine Volunteer River Monitoring Program

Appendix 4

Volunteer Training & Certification Materials

Volunteer River Monitoring Program
Volunteer Certification Workshop Outline

Indoor Training

(*If training is indoors, trainers should fill bucket with water, before beginning training session)*

(1) Introduction of trainers and participants.

(2) Overview of the VRMP and Maine's Water Classification System.

(3) Review of basic water quality parameters and their importance.

(4) Review safety considerations. Volunteers fill out liability forms.

(5) Review Water Sample Collection and Field Data Sheet and Data Management procedures.

Indoor or Outdoor Training

(if weather is poor, then use bucket and river water in the classroom)

(6) Overview of VRMP's Site Description Form and how to complete it *(if applicable).*
   a. Discussion of various parts of the form and definitions of terms.
   b. How to use a GPS unit.
   c. Volunteers practice filling out Site Description Form (see Appendix 6) and then review as a group.

(7) Calibration procedures and Equipment Checks
   a. Individual calibration procedure.
   b. Zero dissolved oxygen check.
   c. Membrane cap replacement.
   d. Sodium thiosulfate test.

(8) Review of monitoring procedures and parameters the volunteers will be using and measuring.

(9) Demonstration of the monitoring procedures by VRMP staff.

(10) Volunteers practice using equipment until level of comfort is achieved.

(11) Testing of the precision and accuracy of volunteers' equipment and techniques.

(12) Summary of monitoring steps and protocols.

(13) Answer any questions and concerns.

(14) Issue certification forms/cards and evaluation forms.

Volunteer River Monitoring Program
Safety Issues and Tips

Working in or around streams generally is not dangerous; however, accidents can happen. The use of common sense is always the best safety precaution. Additionally, follow these recommended tips to have a safe and enjoyable experience. **YOUR SAFETY IS MORE IMPORTANT THAN COLLECTING A SAMPLE!**

- ***Work in teams*** **--** Avoid working alone around water. Children should always be accompanied by watchful adults.
- ***Notify friends or family members*** **–** Tell somebody you know where you will be and when you expect to return. Carry a cell phone, if available, preferably in a waterproof container.
- ***Avoid working in streams during stormy weather or high water*** – Danger increases as water level and velocity rise. Try to stay in shallow areas. If it is specifically required by your Sampling and Analysis Plan to sample during a storm, work in teams and exercise extreme caution.
- ***Avoid being outside when lightning is nearby*** – Avoid water, high ground, and open spaces if lightning is nearby. Avoid all metal objects including extension poles, electric wires, fences, machinery, motors, power tools, etc. If you are outside and lightning is nearby avoid areas underneath canopies, partially-open or small picnic or rain shelters, or near trees. Where possible, find shelter in a substantial building or in a fully enclosed metal vehicle such as a car, truck or a van with the windows completely shut. For more complete information, visit: https://www.weather.gov/safety/lightning .
- ***Be wise with water contact*** – During and after sample collection, keep hands away from eye and mouth areas. Always wash hands with soap and clean water after sampling. Never eat after sampling until hands have been washed. Wear disposable gloves and rubber boots, especially if the stream is likely to be polluted. If there is any concern that the stream may be severely polluted, consult with local health authorities or natural resource agencies for specific warnings or guidance.
- ***Avoid dangerous objects*** – Avoid objects with signs of biohazard or contamination. Be watchful for sharp objects such as broken glass. Do not pick up suspicious objects or stick hands in crevices.
- ***Be aware of hazards*** –
    - Be careful around traffic (wear bright orange clothing or safety vests if working in or near streets and/or bridges).
    - Protect your eyes by watching out for protruding tree branches.
    - Avoid sampling at areas having high or steep stream banks.
    - Do not enter water that goes above your hips.
    - Do not enter water if there is any concern for one's safety (e.g. high, fast flows).
    - Be careful walking on slippery surfaces such as streambanks and stream bottoms.
    - Dress appropriately for field conditions.
    - Wear an appropriate personal floatation device when working in or near water and especially when working in boats.
- ***Avoid working in areas where hunting may be taking place*** **–** Wear two articles of bright orange clothing (hat, vest, etc.) if you are unsure whether hunting is taking place near your stream monitoring sites.
- ***Be prepared for first aid*** **–** Bring a cell phone with you or know the location of a nearby phone in case of emergency and always bring a first-aid kit containing antiseptic, bandages, etc.
- ***Don't lift too much*** **–** If lifting objects into or out of the stream, use proper body mechanics (bend your knees, etc.) and lift only comfortable weights.
- ***Be careful around animals and plants*** **–** Avoid unfamiliar animals. Do not intrude on animal homes. Learn to identify poisonous plants, especially poison ivy, and be aware of your sensitivity to them. Try to avoid trampling a lot of vegetation. Do a tick check after being in the field.

WAIVER OF LIABILITY
MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION

Volunteer River Monitoring Program

The **Volunteer River Monitoring Program** (VRMP) is committed to conducting programs and activities in a safe manner and holds the safety of volunteers in high regard. The VRMP continually strives to reduce risks and asks that all volunteers follow safety rules and instructions that are designed to protect the volunteer's safety. However, volunteers must recognize that there is an inherent risk of injury when choosing to volunteer for the VRMP program. Examples of inherent risks include, but are not limited to, slipping on slick surfaces or falling down steep slopes and incurring bodily harm; being injured or killed by a vehicle or boat; being cut by sharp objects; and drowning/death.

Each volunteer is solely responsible for determining if he or she is physically fit and/or properly skilled for any volunteer activity.

It is strongly urged that all volunteers review their own health insurance policy for coverage. Please read the following carefully and be aware that in consideration for providing volunteer services, you will be expressly assuming the risk and legal liability and waiving and releasing all claims for injuries, damages or loss which you may sustain as a result of participating in any and all activities connected with and associated with your volunteer services (including transportation services/vehicle/and boat operations if provided).

> *As a volunteer, I recognize and acknowledge that there are certain risks of physical injury to volunteers in this program/activity, and I voluntarily agree to assume the full risk of any and all injuries, damages or loss, regardless of severity, that I may sustain as a result of my volunteer services. I further agree to waive and relinquish all claims I may have as a result of my volunteer services against the Volunteer River Monitoring Program, or Maine Department of Environmental Protection, including its directors, officers, employees, or volunteers (hereinafter collectively referred to as "Parties").*
>
> *I do hereby fully release and forever discharge the Parties from any and all claims for injuries, damages, or loss that I may have or which may accrue to me and arising out of, connected with, or in any way associated with my volunteer services.*
>
> *I have read and received a copy of the Safety Issues and Tips.*

Volunteer's Name: _____

Volunteer Group(s): _____

Volunteer Signature: _____

Address: _____

Date: _____

If under the age of 18, this document must be read and signed by a parent or guardian. The minimum age for participation in the VRMP is 14 years old. Adult supervision is required in the field for minors.

Parent Name: _____

Parent Signature: _____

Date: _____ Age (if less than 18):_____

Relevant Information:

We ask that you take the following steps:

1. Follow the direction of the VRMP in the efforts to ensure a goal of safety for everyone involved. This may require changing plans or possibly canceling sampling.
2. Provide the information requested below to the VRMP prior to participation in sampling.
3. If the VRMP asks that you do not participate in an activity, please understand that this decision is made to protect you, other participants, and the VRMP.

2. Whom should VRMP contact in an emergency? ***(optional)***

Name _____ Name _____

Phone Numbers _____ Phone Numbers_____

Relationship _____ Relationship _____

VRMP Volunteer Certification **Group Name:**

Year: **Training Date:** **Training Location (incl. if indoors or river/stream):**

		Temperature (C)				**Dissolved Oxygen (mg/l)**					**Specific Conductance (ug/l)**					
Last Name	First Name	Volunteer Value	Trainer Value	Difference	Acceptable Difference	Volunteer Value	Trainer Value	Difference	Acceptable Difference	DO% determined correctly?	Volunteer Value	Trainer Value	Difference	Acceptable Difference	All Parameters Acceptable?	OTHER PARAMETERS ADDED AS APPROPRIATE
				0	1			0.0	0.3					10%		
				0	1			0.0	0.3					10%		
				0	1			0.0	0.3					10%		
				0	1			0.0	0.3					10%		
				0	1			0.0	0.3					10%		
				0	1			0.0	0.3					10%		
				0	1			0.0	0.3					10%		
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				0	1			0.0	0.3					10%		
				0	1			0.0	0.3					10%		
				0	1			0.0	0.3					10%		

Maine Volunteer River Monitoring Program
Quality Assurance/Quality Control Self-Checklist for Volunteers and Group Leaders

VRMP Group:_____ **Date:**_____

Monitor(s):_____

Sampling Methods	Completed
Sample Collection	
Measurement and samples obtained from a "well-mixed" area (avoiding pools, deadwater and shallows) and checked on the field sheet	
If possible, sampling occurred in "center half of flow"	
Samples collected with minimal disturbance of stream bottom	
If waded, sampled facing upstream so samples not contaminated	
Lab Samples	
Samples obtained using clean technique	
Field duplicate obtained and labeled as duplicate (duplicates should be done for 10% of samples)	
Samples stored and transported to lab on ice	
Field Measurement Duplicates	
Field duplicate obtained by leaving probe in water for ~ 5 minutes and then taking a second reading (duplicates should be done for 10% of measurements)	
Fieldsheets	
Fieldsheet reviewed to ensure that no data is missing and it is legible	
All pertinent sections of fieldsheet including "Chain of Custody", "Observational Data" and "Samples for Laboratory Analysis" completed	
Current VRMP fieldsheet (2014) used-if need more fieldsheets, contact VRMP Coordinator or go to VRMP website	
Meters Procedures	
Dissolved Oxygen Meter	
Meter allowed to warm up at least 20 minutes before calibration and times meter turned on and calibrated recorded on fieldsheet	
Meter calibration values between 97% and 103% (if not-recalibrated)	
Probe inspected and free of air bubbles, and calibration sponge moist	
YSI 550A meter-in freshwater salinity value is entered as zero during calibration	
YSI 550A meter-in estuarine/marine environment salinity value was measured and entered during calibration	
Meter storage case left open overnight to dry out	
Meter stored in a cool dry place and not in vehicle especially during hot weather months	
Zero dissolved oxygen test completed and results recorded on fieldsheet (should be done mid-season and end of season)	

Maine Volunteer River Monitoring Program

Appendix 5

Water Sample Collection and Field Data Sheets and IDEXX Colilert Laboratory Data Sheet

Volunteer River Monitoring Program
WATER SAMPLE COLLECTION AND FIELD DATA SHEET (Tier 1-Profile)

ORGANIZATION: _____ **DATE**: _____ **START TIME**: _____AM/PM

MONITOR(S): _____ **END TIME**: _____AM/PM

PAST 24 HOURS WEATHER: (*CIRCLE ALL THAT APPLY)*

CLEAR	FOGGY
CLOUDY	LIGHT RAIN
PARTLY CLOUDY	HEAVY RAIN
MOSTLY CLOUDY	SLEET
SHOWERS	SNOW

CURRENT WEATHER: (*CIRCLE ALL THAT APPLY)*

CLEAR	FOGGY
CLOUDY	LIGHT RAIN
PARTLY CLOUDY	HEAVY RAIN
MOSTLY CLOUDY	SLEET
SHOWERS	SNOW

ADDITIONAL COMMENTS:

TIDAL INFORMATION: (*optional)*

_____(AM/PM) TIME OF HIGH TIDE

_____(AM/PM) TIME OF LOW TIDE

AIR TEMPERATURE: (*optional)*

_____ (°F) _____ (°C)

AIR CONDITIONS:

□ CALM
□ BREEZE
□ STRONG WIND

QA/QC CHECK

DO METER NUMBER (see tag): _____ **DO METER TYPE:** _____		**STANDARD VALUES**	**READING/VALUE AFTER CALIBRATION (Cal.)**
DISSOLVED OXYGEN (D.O.) (METER)	_____**TIME METER TURNED ON** ___**TIME OF CALIBRATION** NOTE: Most D.O. meters must be turned on 15 minutes prior to calibrating ☐ **MEMBRANE INSPECTED***		**% sat.** D.O. "Reading After Cal." is measured in cal. chamber. Recalibrate if "After" value is < 97 % or > 103 %.
DISSOLVED OXYGEN (KIT)	☐ **SODIUM THIOSULFATE TEST DATE:** _____ **TIME:** _____ ☐ **CHEMICAL EXP. DATES CHECKED**		
SPECIFIC CONDUCTANCE	(***PROBE CHECKED AND CALIBRATED BEGINNING OF SAMPLING SEASON)*** ☐ **PROBE INSPECTED FOR DAMAGE OR FOULING**		
TURBIDITY	☐ **METER INSPECTED** □ **CALIBRATED AGAINST STANDARDS** **(Make "after cal." measurement of standard within the turbidity meter.)**		
pH	**CALIBRATED WITH: (2 BUFFERS)** **EFFICIENCY/** ☐ **pH 4** ☐ **pH 7** ☐ **pH 10** **SLOPE:** _____	**pH:** **pH:**	

MEMBRANE INSPECTION GUIDELINES

Check to ensure the membrane is not loose, wrinkled, damaged, or fouled and there are no bubbles in the electrolyte reservoir, if applicable, to your make and model.

ZERO SATURATION DISSOLVED OXYGEN TEST CHECK *(Shall be done 2X over field season)*

DATE CONDUCTED: _____ **INITIALS**: _____

DO READINGS: (RINSE PROBE WELL AFTER CONDUCTING CHECK) _____ (mg/L)*

DO METER TYPE: _____ **DO METER NUMBER** (see tag): _____

* If mg/L readings are > 0.5 mg/L of the zero-D.O. solution, contact your group leader and a VRMP representative.

CHAIN OF CUSTODY

CHECK ALL THAT APPLY:

□ **DATASHEET** □ **SAMPLE**

SUBMITTED BY (VOLUNTEER): _____ **DATE:** _____ **TIME:** _____ **AM / PM**

NOTES (ISSUES/ACTIONS):

[IF APPLICABLE]

SAMPLE RECEIVED BY (ANALYST): _____ **DATE:** _____ **TIME SAMPLE ANALYZED:** _____ **AM/ PM**

NOTES (ISSUES/ACTIONS):

DATASHEET PROOFED AND SUBMITTED BY: _____ **DATE:** _____

(VOLUNTEER GROUP DATA MANAGER)

NOTES (ISSUES/ ACTIONS):

QA/QC'd BY VRMP STAFF: _____ **DATE:** _____

NOTES (ISSUES/ACTIONS):

***** MEASUREMENTS AND SAMPLES WERE OBTAINED FROM A WELL-MIXED AREA (check here to confirm)** ☐

SAMPLE FIELD MEASUREMENTS *PLUS* LOCATION/DATE/TIME INFORMATION

(FOR METER MEASUREMENTS *AND* GRAB SAMPLES {E. COLI BACTERIA, TURBIDITY, ETC.})

SITE ID #	WATERBODY/ SITE NAME	TIME SAMPLED	SAMPLING LOCATION (SELECT ONE) 1) WADING 2) BRIDGE 3) BOAT 4) BANK 5) CULVERT	WATER TEMP. (°C)	VERTICAL DEPTH (SELECT ONE) NON-WADEABLE 1) MID-DEPTH 2) 3 FT BELOW SURFACE WADEABLE 3) MID-DEPTH 4) 1.5 FT BELOW SURFACE	DISSOLVED OXYGEN (D.O.)* TIER 2 ONLY mg\L	% sat	D.O. SAMPLE COLLECTION METHOD (SELECT ONE) 1) EXTENSION POLE & PROBE 2) VAN DORN 3) ARI SAMPLER 4) KEMMERER 5) PROBE ONLY (DIRECT PROBE)	SPECIFIC CONDUCT-ANCE (µs/cm) *(Circle One)* 1) PEN 2) METER	pH	TURBIDITY *(Circle One)* 1) TUBE (cm) 2) METER (NTU)	TDS (mg/L)	SALINITY (PPTh)
QA/ QC FIELD DUPLICATE (*1 duplicate per 10 measurements) Remember to wait 5 minutes before taking duplicate measurement.*													

***FOR TIER 1 DISSOLVED OXYGEN & TEMPERATURE MEASUREMENTS, USE DEPTH PROFILE DATA SHEET.**

OBSERVATIONAL DATA

(PLEASE SELECT ONE NUMBER FOR EACH CATEGORY)

SITE ID #	WATERBODY/ SITE NAME	WATER LEVEL	HABITAT	WATER APPEARANCE	WATER ODOR	FLOW	TIDAL STAGE (*OPTIONAL*)
		1) HIGH 2) MEDIUM 3) LOW	1) RIFFLE 2) RUN 3) CASCADE	1) CLEAR 2) DARKLY STAINED 3) MEDIUM STAINED 4) FOAMY 5) GREEN 6) MILKY 7) OPAQUE 8) TURBID/ MUDDY	1) NORMAL 2) CHEMICAL 3) FISHY 4) MANURE 5) ANAEROBIC (ROTTEN EGG) 6) PETROLEUM 7) SEWAGE	1) BASEFLOW 2) STORMFLOW	1) HIGH 2) HIGH EBB 3) EBB 4) LOW EBB 5) LOW 6) LOW FLOOD 7) FLOOD 8) HIGH FLOOD

ADDITIONAL COMMENTS:

SAMPLES FOR LABORATORY ANALYSIS

SITE ID #	WATERBODY/ SITE NAME	TIME SAMPLE COLLECTED	SAMPLE CONTAINER 1) PLASTIC 2) GLASS 3) WHIRLPAK	BACTERIA (CHECK PARAMETERS TO BE ANALYZED) *E. coli*	Fecal Coliform	*Enterococcus*	Total Coliform	OTHER ANALYSES 1) TOTAL DISSOLVED SOLIDS 2) TOTAL SUSPENDED SOLIDS 3) SUSPENDED SEDIMENT CONCENTRATION 4) CHLORIDE 5) TOTAL PHOSPHORUS 6) ORTHO-PHOSPHORUS 7) TOTAL NITROGEN 8) TOTAL KJEDAHL NITROGEN 9) NITRATE (NO_3) + NITRITE (NO_2) 10) ALKALINITY
QA/ QC COLLECTION DUPLICATE (*1 duplicate per 10 samples)*								

Volunteer River Monitoring Program
WATER SAMPLE COLLECTION AND FIELD DATA SHEET (Tier 2)

ORGANIZATION: _____ **DATE**: _____ **START TIME**: _____AM/PM

MONITOR(S): _____ **END TIME**: _____AM/PM

PAST 24 HOURS WEATHER: (*CIRCLE ALL THAT APPLY)*

CLEAR FOGGY
CLOUDY LIGHT RAIN
PARTLY CLOUDY HEAVY RAIN
MOSTLY CLOUDY SLEET
SHOWERS SNOW

CURRENT WEATHER: (*CIRCLE ALL THAT APPLY)*

CLEAR FOGGY
CLOUDY LIGHT RAIN
PARTLY CLOUDY HEAVY RAIN
MOSTLY CLOUDY SLEET
SHOWERS SNOW

ADDITIONAL COMMENTS:

TIDAL INFORMATION: (*optional)*

_____(AM/PM) TIME OF HIGH TIDE

_____(AM/PM) TIME OF LOW TIDE

AIR TEMPERATURE: (*optional)*

_____ (°F) _____ (°C)

AIR CONDITIONS:

□ CALM
□ BREEZE
□ STRONG WIND

QA/QC CHECK

DO METER NUMBER (see tag): _____ **DO METER TYPE:** _____		**STANDARD VALUES**	**READING/VALUE AFTER CALIBRATION (Cal.)**
DISSOLVED OXYGEN (D.O.) (METER)	_____**TIME METER TURNED ON** _____**TIME OF CALIBRATION** NOTE: Most D.O. meters must be turned on 15 minutes prior to calibrating ☐ **MEMBRANE INSPECTED***		**% sat.** D.O. "Reading After Cal." is measured in cal. chamber. Recalibrate if "After" value is < 97 % or > 103 %.
DISSOLVED OXYGEN (KIT)	☐ **SODIUM THIOSULFATE TEST DATE:** _____ **TIME:** _____ ☐ **CHEMICAL EXP. DATES CHECKED**		
SPECIFIC CONDUCTANCE	(***PROBE CHECKED AND CALIBRATED BEGINNING OF SAMPLING SEASON)*** ☐ **PROBE INSPECTED FOR DAMAGE OR FOULING**		
TURBIDITY	☐ **METER INSPECTED** □ **CALIBRATED AGAINST STANDARDS** **(Make "after cal." measurement of standard within the turbidity meter.)**		
pH	**CALIBRATED WITH: (2 BUFFERS)** **EFFICIENCY/** ☐ **pH 4** ☐ **pH 7** ☐ **pH 10** **SLOPE:** _____	**pH:** **pH:**	

MEMBRANE INSPECTION GUIDELINES

Check to ensure the membrane is not loose, wrinkled, damaged, or fouled and there are no bubbles in the electrolyte reservoir, if applicable, to your make and model.

ZERO SATURATION DISSOLVED OXYGEN TEST CHECK *(Shall be done 2X over field season)*

DATE CONDUCTED: _____ **INITIALS**: _____

DO READINGS: (RINSE PROBE WELL AFTER CONDUCTING CHECK) _____ (mg/L)*

DO METER TYPE: _____ **DO METER NUMBER** (see tag): _____

* If mg/L readings are > 0.5 mg/L of the zero-D.O. solution, contact your group leader and a VRMP representative.

CHAIN OF CUSTODY

CHECK ALL THAT APPLY:

□ **DATASHEET** □ **SAMPLE**

SUBMITTED BY (VOLUNTEER): _____ **DATE:** _____ **TIME:** _____ **AM / PM**

NOTES (ISSUES/ACTIONS):

[IF APPLICABLE]

SAMPLE RECEIVED BY (ANALYST): _____ **DATE:** _____ **TIME SAMPLE ANALYZED:** _____ **AM/ PM**

NOTES (ISSUES/ACTIONS):

DATASHEET PROOFED AND SUBMITTED BY: _____ **DATE:** _____

(VOLUNTEER GROUP DATA MANAGER)

NOTES (ISSUES/ ACTIONS):

QA/QC'd BY VRMP STAFF: _____ **DATE:** _____

NOTES (ISSUES/ACTIONS):

***** MEASUREMENTS AND SAMPLES WERE OBTAINED FROM A WELL-MIXED AREA (check here to confirm) ☐**

SAMPLE FIELD MEASUREMENTS *PLUS* LOCATION/DATE/TIME INFORMATION

(FOR METER MEASUREMENTS *AND* GRAB SAMPLES {E. COLI BACTERIA, TURBIDITY, ETC.})

SITE ID #	WATERBODY/ SITE NAME	TIME SAMPLED	SAMPLING LOCATION (SELECT ONE) 1) WADING 2) BRIDGE 3) BOAT 4) BANK 5) CULVERT	WATER TEMP. (°C)	VERTICAL DEPTH (SELECT ONE) NON-WADEABLE 1) MID-DEPTH 2) 3 FT BELOW SURFACE WADEABLE 3) MID-DEPTH 4) 1.5 FT BELOW SURFACE	DISSOLVED OXYGEN (D.O.)* TIER 2 ONLY mg\ L	% sat	D.O. SAMPLE COLLECTION METHOD (SELECT ONE) 1) EXTENSION POLE & PROBE 2) VAN DORN 3) ARI SAMPLER 4) KEMMERER 5) PROBE ONLY (DIRECT PROBE)	SPECIFIC CONDUCT-ANCE (µs/cm) *(Circle One)* 1) PEN 2) METER	pH	TURBIDITY *(Circle One)* 1) TUBE (cm) 2) METER (NTU)	TDS (mg/L)	SALINITY (PPTh)
QA/ QC FIELD DUPLICATE (*1 duplicate per 10 measurements) Remember to wait 5 minutes before taking duplicate measurement.*													

OBSERVATIONAL DATA

(PLEASE SELECT ONE NUMBER FOR EACH CATEGORY)

SITE ID #	WATERBODY/ SITE NAME	WATER LEVEL 1) HIGH 2) MEDIUM 3) LOW	HABITAT 1) RIFFLE 2) RUN 3) CASCADE	WATER APPEARANCE 1) CLEAR 2) DARKLY STAINED 3) MEDIUM STAINED 4) FOAMY 5) GREEN 6) MILKY 7) OPAQUE 8) TURBID/ MUDDY	WATER ODOR 1) NORMAL 2) CHEMICAL 3) FISHY 4) MANURE 5) ANAEROBIC (ROTTEN EGG) 6) PETROLEUM 7) SEWAGE	FLOW 1) BASEFLOW 2) STORMFLOW	TIDAL STAGE (*OPTIONAL*) 1) HIGH 2) HIGH EBB 3) EBB 4) LOW EBB 5) LOW 6) LOW FLOOD 7) FLOOD 8) HIGH FLOOD

ADDITIONAL COMMENTS:

SAMPLES FOR LABORATORY ANALYSIS

SITE ID #	WATERBODY/ SITE NAME	TIME SAMPLE COLLECTED	SAMPLE CONTAINER 1) PLASTIC 2) GLASS 3) WHIRLPAK	BACTERIA (CHECK PARAMETERS TO BE ANALYZED) *E. coli*	Fecal Coliform	*Enterococcus*	Total Coliform	OTHER ANALYSES 1) TOTAL DISSOLVED SOLIDS 2) TOTAL SUSPENDED SOLIDS 3) SUSPENDED SEDIMENT CONCENTRATION 4) CHLORIDE 5) TOTAL PHOSPHORUS 6) ORTHO-PHOSPHORUS 7) TOTAL NITROGEN 8) TOTAL KJEDAHL NITROGEN 9) NITRATE (NO_3) + NITRITE (NO_3) 10) ALKALINITY
QA/ QC COLLECTION DUPLICATE (*1 duplicate per 10 samples)*								

Volunteer River Monitoring Program
(TIER 1) DISSOLVED OXYGEN AND TEMPERATURE DEPTH PROFILE FIELD DATA SHEET

ORGANIZATION: _____ DATE: _____

VOLUNTEER MONITOR(S): _____ SITE ID#: _____

WATERBODY/ SITE NAME: _____

TOWN: _____

(The lowest depth sampled should be the last meter increment above the river bottom.)

DEPTH (m)	TEMPERATURE (°C)	DISSOLVED OXYGEN (% sat)	DISSOLVED OXYGEN (mg/l)	SALINITY (PPTh)
Surface				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
QA/QC FIELD DUPLICATE (1 duplicate per 10 samples):				

Secchi Disk Depth: _____ m

Depth of River Channel Where Measurements Were Made: _____ m

Notes:

Volunteer River Monitoring Program
IDEXX COLILERT/ENTEROLERT LABORATORY DATA SHEET

ANALYST NAME: ____ DATE: __________ MEDIA LOT# & EXP. DATE: ________________

ORGANIZATION: ____ MEDIA USED (*circle one*): COLILERT ENTEROLERT

IDEXX COLILERT/ENTEROLERT- LABORATORY ANALYSES

SITE ID #	WATERBODY/ SITE NAME	TIME SAMPLE RECEIVED	TIME SAMPLE ANALYZED	WATER TEMPERATURE OF SAMPLES PRIOR TO ANALYSIS *	IS SAMPLE: 1) DUPLICATE 2) BLANK 3) SPIKE (SELECT ONE, IF APPLICABLE)	SAMPLE INCUBATED (IN)	SAMPLE INCUBATED (OUT)	IDEXX MPN CELL COUNTS (*E.coli or Entero.*)	IDEXX MPN CELL COUNTS (TOTAL COLIFORM)	COUNTS/100ml (TC = TOTAL COLIFORM)
						DATE: / /	DATE: / /	LARGE	LARGE	*E. coli or Entero.*
						TIME: AM/PM	TIME: AM/PM	SMALL	SMALL	TC
						DATE: / /	DATE: / /	LARGE	LARGE	*E. coli or Entero.*
						TIME: AM/PM	TIME: AM/PM	SMALL	SMALL	TC
						DATE: / /	DATE: / /	LARGE	LARGE	*E. coli or Entero.*
						TIME: AM/PM	TIME: AM/PM	SMALL	SMALL	TC
						DATE: / /	DATE: / /	LARGE	LARGE	*E. coli or Entero.*
						TIME: AM/PM	TIME: AM/PM	SMALL	SMALL	TC

* Each cooler of samples received should contain a sample bottle or bag separate from the sample to be analyzed. The purpose of the extra sample bottle is to measure the water temperature of the samples prior to lab analyses.

TO AVOID CONTAMINATION, DO NOT STICK THERMOMETER IN ACTUAL SAMPLE TO BE ANALYZED.

* If sample for Enterococcus was diluted, be sure to use and record correct dilution factor.

CHAIN OF CUSTODY

DATASHEET SUBMITTED BY (ANALYST): ____________________________ **DATE:** ______________________ **NOTES (ISSUES/ACTIONS):**

DATASHEET PROOFED AND SUBMITTED BY: __________________________ **DATE:** ______________________ **NOTES (ISSUES/ ACTIONS):**
(VOLUNTEER GROUP DATA MANAGER)

QA/QC'd BY VRMP STAFF: ____ **DATE:** ____________________ **NOTES (ISSUES/ACTIONS):**

Maine Volunteer River Monitoring Program

Appendix 6

Sampling Site Description Form

Volunteer River Monitoring Program
SAMPLING SITE DESCRIPTION FORM

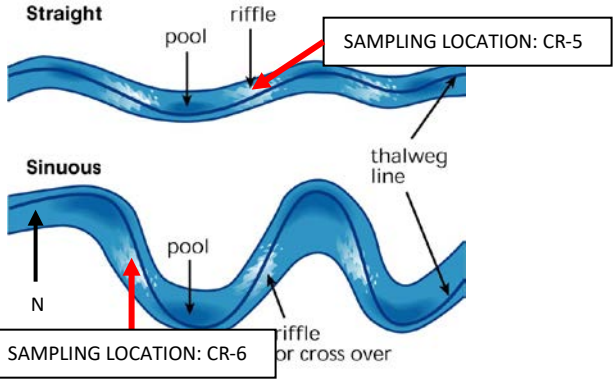
SITE ID #:		**SITE NAME:**			
STREAM/RIVER NAME:		**DATE:**			
TOWN:		**UTM NORTHING:**	_ _ _ _ _ _ _	**GPS MAKE/MODEL:**	
VRMP Use Only **STATUTORY STREAM CLASSIFICATION**		**UTM EASTING:**	0 _ _ _ _ _ _ _	**ESTIMATED GPS ACCURACY:**	
		-----DATUM MUST BE IN NAD83 or WGS84----			
POLLUTION ISSUES:					
RIPARIAN DISTURBANCE:	**YES / NO**	**If YES, describe:**			
CANOPY COVER:	**0 – 20%**	**20 – 40%**	**40 – 60%**	**60 – 80%**	**80 – 100%**
CHANNEL WIDTH : ***(estimated or measured)***	**circle:** ***(feet / meters)***	***AVOID IF SAFETY IS AN ISSUE *** **MID-CHANNEL DEPTH:** ***(estimated or measured)***		**circle:** ***(feet / meters)***	

DOMINANT/ PRIMARY STREAM BOTTOM HABITAT TYPE:	**FINES**	**SAND**	**BOULDER**	**GRAVEL**	**COBBLE**	**BEDROCK/LEDGE**
SECONDARY STREAM BOTTOM HABITAT TYPE:	**FINES**	**SAND**	**BOULDER**	**GRAVEL**	**COBBLE**	**BEDROCK/LEDGE**
DOMINANT RIPARIAN VEGETATION:	**WETLAND VEGETATION (e.g. CATTAILS)**	**GRASS**	**SHRUB (ALDERS, DOGWOOD, ETC.)**	**MIXED SUCCESSIONAL**	**MATURE TREES**	**FERNS**
POSITION SAMPLE TO BE COLLECTED ***(Refer to Table 1 on Page 2 for guidance)*** **HORIZONTAL:**	**MIDDLE**	**THALWEG**	**EDGE, NEAR OUTSIDE OF RIVER BEND**	**DOCK**	**EDGE OF CONSTRICTED AREA**	**FROM A BRIDGE**
VERTICAL:	**MID-DEPTH OF WATER**		**> HALF-ARM'S LENGTH DEPTH INTO WATER (~ 1 ½ FEET)**		**DEPTH PROFILE (1-m increments)**	

IS THE SAMPLING LOCATION IN THE "CENTER OF FLOW' AS DESCRIBED IN TABLE 1 ON PAGE 2? _____ YES _____ NO

SITE SKETCH — ALSO, PLEASE ATTACH PHOTOGRAPHS TO FORM.
(*INCLUDE A NORTH ARROW AND, IF APPLICABLE, LOCATION AND ID CODES/ NAMES ON SKETCH)*

INCLUDE HABITAT TYPES NEAR YOUR SITE. THIS INCLUDES RIFFLES, RUNS, POOLS, CASCADES, AND DEADWATER.



CONTINUED ON NEXT PAGE

SITE LOCATION MONITORING LOCATION AND SITE SKETCH

TABLE 1: Required river/stream sampling and monitoring locations for inclusion in the VRMP

Lateral Position Across a River/Stream

→ Sampling/monitoring needs to occur so that a flowing, well-mixed, representative sample is collected. If possible, volunteers should try to sample in the "center half of flow". This is usually close to the middle of the channel, though it sometimes can move away from the middle of the channel, following the thalweg (Figure 2) towards the outside of a river-bend.

→ VRMP staff must approve all sampling locations to ensure that a well-mixed sample can be obtained.

→ Samplers need to avoid shore-related features such as:
- eddies
- deadwaters
- shallows
- jetties
- pools (even though parts of the thalweg may pass through them)
- docks (unless they are within the center half of flow).

→ To reach the "center half of flow", volunteers can use a variety of techniques including:
- wading out by foot
- reaching out
- using an extension pole
- using a boat
- sampling from a bridge/culvert using a VRMP-approved water sampling device [1]

Vertical Position in a River/Stream

(In all cases, avoid allowing water surface films or "stirred-up bottom sediments" into the sample. Always face upstream when sampling.)

(*For Tier 1 Dissolved Oxygen & Temperature*)

→ For rivers/streams < 3 m in depth, sample at mid-depth.

→ For rivers/streams ≥ 3 m in depth, sample at 1-m increments to obtain a vertical profile.

(*For Tier 2 Dissolved Oxygen & Temperature as well as any Other Water Quality Parameters*)

→ For rivers/streams that are non-wadeable, sample at mid-depth (if depth is known) or 1-meter below the surface.

→ For rivers/streams that are wadeable, sample at mid-depth or 1 ½ feet below the surface. (Volunteers will specify which depth on their data sheet.)

Longitudinal Position in a River/Stream

(when near crossing such as a bridge or culvert)

→ To avoid the possible effects of roads, bridges, or scour pools on water quality, the preferred location to sample is at the upstream end of a bridge or culvert crossing (as opposed to the downstream end) *unless*:

(1) it is safer to sample at the downstream end;

(2) the purpose of sampling at the downstream end of the crossing is to include any effects of the crossing on water quality.

→ Be sure to document where the sampling takes place with respect to a crossing.

Impoundments

→ Sample as close as possible* to the deepest "hole" (depth) of the impoundment – generally in the vicinity of the upstream side of the dam. Bathymetry maps or sonar equipment can be used to determine river depths. *(Do not risk your safety! Do not get too close to the dam! Do not go into "roped-off" sections of the impoundment.)

[1] See VRMP's QAPP's section 5.2 and Appendix 2 (Standard Operating Procedure - Methods for Collecting Water Grab Samples) for details regarding VRMP-approved water sampling devices.

SITE LOCATION DESCRIPTION — (*Include landowner information, directions to the site, surrounding land use, and landmarks)*

Maine Volunteer River Monitoring Program

Appendix 7

Sample Chain of Custody Form

State of Maine
Health and Environmental Testing Lab

221 State Street Station #12 Augusta, ME 04333-0012
Phone (207) 287 – 2727 Fax (207) 287-1884

Chain - of - Custody

Sample Date: _____
Town/County: _____
Project Name: _____

Company:	Appropriation/PO#	Compliance sample Y / N
Contact:	Bill To:	Copy To:
Address:	Address:	Address
Phone: Fax:	Phone: Fax:	Phone: Fax:
e-Mail address:	e-Mail address:	e-Mail address

Sample ID	Sample time	Preservation	Container vol	Container type	Quantity	Grab or Composite	Matrix: Ground Water / Waste Water / Drinking Water / Solids / Other	Analyses Required	HETL Number

Notes:

Sampled By Date/Time Received By Date/Time

Relinquished By Date/Time Received By Date/Time

Relinquished By Date/Time Received By Date/Time

Rush (Yes or No) | Fax Results (Yes or No) | Custody seal intact (Yes or No) | Temperature on Arrival ^{o}C

If the sample is deemed hazardous it may be returned to the client at your expense for proper disposal

rev 5/11/07

By signing this Chain-of-Custody you agree that the limit of The HETL's liability to be the cost of the analytical fees in question

Maine Volunteer River Monitoring Program (VRMP)

Appendix 8

VRMP-Approved Laboratory Criteria, Laboratories, & QA/QC Forms

VRMP-Approved Laboratory Criteria

In order for a laboratory to be approved for providing the VRMP with data, on a water quality parameter-by-parameter basis, they must meet at least one of the following criteria:

1. Be a Maine Certified Laboratory, as determined by MRS Title 22, Chapter 157-A § 567 for the parameter in question. For list of Maine Certified Laboratories, refer to State of Maine Health & Environmental Testing Laboratory website: https://www.maine.gov/dhhs/mecdc/environmental-health/dwp/professionals/labCert.shtml

   -or-

2. Have acceptable proficiency test results (no more than 1 year old), for the parameter in question, as determined by the National Water Research Institute – Environment Canada (NWRI) or Norwegian Institute for Water Research (NIVA), or both, depending on the parameter.

   -or-

3. For local volunteer laboratories conducting IDEXX "Colilert" {*E. coli*, Total coliform} or IDEXX "Enterolert" {*Enterococcus*, Total coliform}bacteria analyses: pass QA/QC approval by VRMP staff who will be using an adaptation of a protocol and checklist similar to that in the Maine Healthy Beaches Program (MHBP) 2016 QAPP. The protocol and checklist, mentioned below, has been adapted from the MHBP "Enterolert" method (*Enterococcus* bacteria) to the "Colilert" method {*E. coli* and Total coliform bacteria} with the assistance of Matthew Sica (formerly Maine Department of Health & Human Services, Division of Environmental Health, Laboratory Certification Officer).
   a. Original QA/QC protocol (App. I, section Quality Control performed by Nelson Analytical laboratory of Springvale, ME [minus the tests of distilled water as dilutions are not expected for the VRMP]; MHBP, 2016).
   b. Original checklist (Appendix I; MHBP, 2016).
   c. The newly-adapted protocol and checklist can be found in the VRMP QAPP (Appendix 8b & 8c).

   -or-

4. For municipal wastewater treatment facilities who might perform *E. coli* or *Enterococcus* bacteria analyses for volunteer groups, those facilities would need to be operations that fall under the jurisdiction of the MEPDES program run by Maine DEP, and those operations would need to have received acceptable annual and 5-year inspections, annual Discharge Monitoring Report–Quality Assurance (DMR-QA) results, and other assessments as determined by consultation with Maine DEP MEPDES program staff (contact the VRMP Program Director to obtain the names of the appropriate staff).

QA/QC Checklist for IDEXX Colilert -- Maine Volunteer River Monitoring Program

Laboratory Name and ID: _____
Dates of Document Assessment: _____
Date of On Site Assessment: _____
Assessor (Initials) Completing Checklist: _____

		Documents COMPLIANT			Onsite COMPLIANT			Comments and Corrective Actions
IDEXX Colilert-18 or Colilert- 24 with Quanti-Tray®/2000		**Y**	**N**	**NA**	**Y**	**N**	**NA**	
Is media stored at 4 to 30°C without exposure to direct light?								
Is unopened media older than 12 months discarded?								
Is Quanti-Tray®/2000 (counting range of 2,419 per 100 mL) used for analysis?								(**Note**: Dilutions are rarely necessary when this tray is used.)
Is the appropriate fluorescence Quanti-Tray®/2000 comparator available and is it stored in the dark at 2-30°C?								Expired comparators must be discarded.
Is incubator capable of maintaining 35 ± 0.5°C?								
Are only glassware or plasticware that will not auto-fluoresce used during this analysis?								
Are samples dechlorinated (if chlorine is present) and cooled to 10°C immediately after collection?								
Is sample holding time of 6 hours being met?								
Once Colilert Snap Pack is separated from strip, is it tapped to ensure that all of the powder is at the bottom part of the pack prior to opening it?								
Is powder always added to 100 mL of sample or sample dilutions?								
Is sample gently mixed after Colilert media is added and prior to pouring into Quanti-Tray®/2000?								(**Note**: All media may not dissolve during mixing. It should, however, be completely dissolved after incubation.)
Is sample incubated 18 – 22 hrs. for Colilert-18; or 24 – 28 hrs. for Colilert-24 at 35 ± 0.5°C with fluorescence determined immediately upon removal from incubator?								
Is fluorescence checked in a dark environment by holding a 6 watt UV lamp with a 365 nm wavelength three to five inches away from sample?								

Laboratory Name and ID: _____
Dates of Document Assessment: _____
Date of On Site Assessment: _____
Assessor (Initials) Completing Checklist: _____

		Documents COMPLIANT			Onsite COMPLIANT			Comments and Corrective Actions
IDEXX Colilert-18 or Colilert- 24 with Quanti-Tray®/2000		**Y**	**N**	**NA**	**Y**	**N**	**NA**	
If an effluent sample has a background color when collected, has the inoculated/incubated sample been compared to a control blank?								**Note**: Blank consists of an aliquot of the same sample in the same type of container that has not been inoculated and was held at room temperature.
For samples with E. coli, is fluorescence at least equal to the level of that in the comparator?								(Typically the florescence will be much greater in positive samples.)
Is MPN properly calculated using the IDEXX MPN table?								
Are blanks analyzed for each lot of media and Quanti-Tray® containers?								
Are positive and negative controls analyzed for each lot of media used?								
Are used Quanti-Trays® and sample collection containers to which Colilert-18 was added autoclaved at 121°C for 15-30 minutes at 15 pounds of pressure prior to disposal?								
Quanti-Tray sealer checked every two months during sampling season by adding food-coloring dye to 100 mL of water sealed in tray and observing for leakage.								

QA/QC Checklist for IDEXX Enterolert -- Maine Volunteer River Monitoring Program

Laboratory Name and ID: _____
Dates of Document Assessment: _____
Date of On Site Assessment: _____
Assessor (Initials) Completing Checklist: _____

		Documents COMPLIANT			Onsite COMPLIANT			Comments and Corrective Actions
IDEXX Enterolert- with Quanti-Tray®/2000		**Y**	**N**	**NA**	**Y**	**N**	**NA**	
Is media stored at 4 to 30°C without exposure to direct light?								
Is unopened media older than 12 months discarded?								
Is Quanti-Tray®/2000 (counting range of 2,419 per 100 mL) used for analysis?								
Is the appropriate fluorescence Quanti-Tray®/2000 comparator available and is it stored in the dark at 2-30°C?								Expired comparators must be discarded.
Is incubator capable of maintaining 41 ± 0.5°C?								
Are only glassware or plasticware that will not auto-fluoresce used during this analysis?								
Are samples dechlorinated (if chlorine is present) and cooled to 10°C immediately after collection?								
Is sample holding time of 6 hours being met?								
Once Colilert Snap Pack is separated from strip, is it tapped to ensure that all of the powder is at the bottom part of the pack prior to opening it?								
Is powder always added to 100 mL of sample or sample dilutions?								
Is sample gently mixed after Enterolert media is added and prior to pouring into Quanti-Tray®/2000?								(**Note**: All media may not dissolve during mixing. It should, however, be completely dissolved after incubation.)
Is sample 24 – 28 hrs. at 41 ± 0.5°C with fluorescence determined immediately upon removal from incubator?								
Is fluorescence checked in a dark environment by holding a 6 watt UV lamp with a 365 nm wavelength three to five inches away from sample?								

Laboratory Name and ID: _____
Dates of Document Assessment: _____
Date of On Site Assessment: _____
Assessor (Initials) Completing Checklist: _____

		Documents COMPLIANT			Onsite COMPLIANT			Comments and Corrective Actions
IDEXX Enterolert- with Quanti-Tray®/2000		**Y**	**N**	**NA**	**Y**	**N**	**NA**	
If an effluent sample has a background color when collected, has the inoculated/incubated sample been compared to a control blank?								**Note**: Blank consists of an aliquot of the same sample in the same type of container that has not been inoculated and was held at room temperature.
For samples with Enterococcus, is fluorescence at least equal to the level of that in the comparator?								(Typically the florescence will be much greater in positive samples.)
Is MPN properly calculated using the IDEXX MPN table?								
If sample was diluted, was calculated MPN multiplied by the appropriate dilution factor?								
Are blanks analyzed for each lot of media and Quanti-Tray® containers?								
Are positive and negative controls analyzed for each lot of media used?								
Are used Quanti-Trays® and sample collection containers to which Enterolert was added autoclaved at 121°C for 15-30 minutes at 15 pounds of pressure prior to disposal?								
Quanti-Tray sealer checked every two months during sampling season by adding food-coloring dye to 100 mL of water sealed in tray and observing for leakage.								

IDEXX Colilert and Enterolert Bacteria Analysis Method
- Sterility Checks, Blanks, Positive and Negative Controls -

At the start of each sampling season, each local volunteer laboratory using the IDEXX Colilert or Enterolert method will be assessed by VRMP staff:

1. Using a QA/QC checklist developed in partnership with the Department of Health and Human Services Laboratory Certification Officer (see QA/QC Checklist for IDEXX Colilert (VRMP QAPP Appendix 8b) or Enterolert (VRMP QAPP Appendix 8c).

2. Having sterility check, blank, positive, and negative control tests performed on pre/un-used sample media and related equipment by Nelson Analytical (Springvale, ME) – a laboratory certified by the NELAC Institute for the similar method Colilert. Nelson Analytical sterility checks all IDEXX Colilert and Enterolert supplies and reagents before they are utilized by volunteer laboratories in the VRMP.
    a. These assessments include testing each lot of the Quanti-Tray 2000 units, sample vessels and single-use pipettes. Each lot of Colilert or Enterolert media is used before the listed expiration date and stored in a cool (20-30 ^{o}C) dry place out of direct sunlight. Each lot is quality checked using a positive culture to ensure growth of the target organism, and all Quanti-Tray cells must exhibit fluorescence, the expected reaction to the target organism. Each lot of media is also tested using two negative controls to demonstrate the media does not support the growth of non-target organisms. Each laboratory also processes one blank (distilled water and media) for each group of samples processed.
    b. The data quality objective for blanks is <10 MPN. For each laboratory 10% of the laboratory samples are duplicated and the RPD regularly assessed.